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THE ECONOMIC IMPACT AND STATUS OF THE OFFSHORE FISHING INDUSTRY IN VIRGINIA

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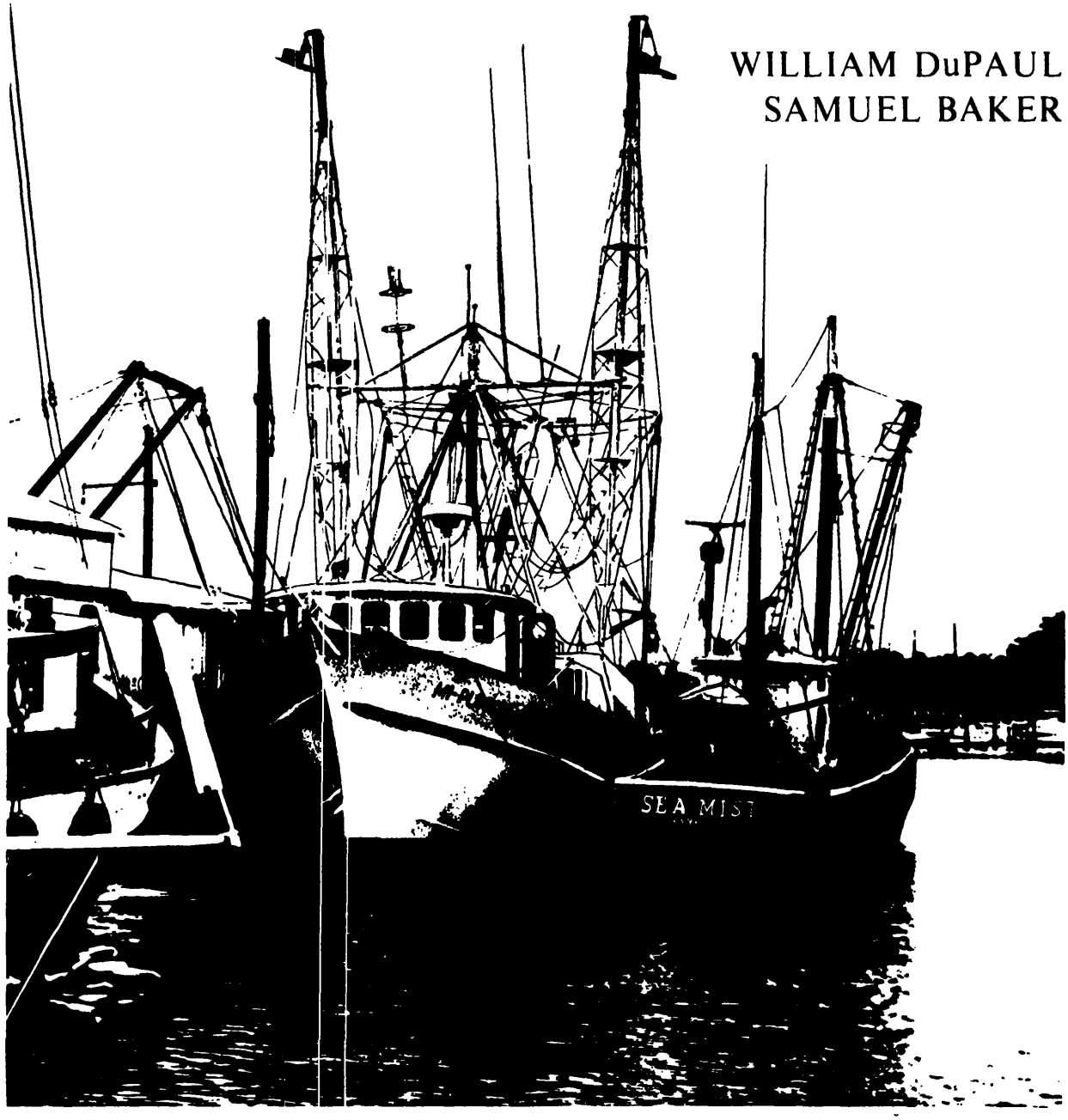

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VIMS
SEA
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PROGRAM

The Economic Impact and Status of the Offshore Fishing Industry in Virginia

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INTRODUCTION

The offshore fishing industry of Virginia has expanded and changed to a considerable extent in recent years. New vessels are entering the fishery at an increasing rate, fisherman from other areas are moving to Virginia, older processing plants are being revitalized and employment has increased both on vessels and in related shoreside occupations. The potential profitability of the offshore fishing industry, which has been the driving force behind this expansion, has been influenced by factors ranging from the abundance of certain fishery stocks to the enactment of the Fisheries Conservation and Management Act (FCMA) of 1976.

The FCMA has influenced growth by eliminating some of the risk involved in an expanding fishery. The law was written to conserve the resources, and through proper management, maintain the highest production levels possible. The FCMA also provides that only those fishery resources in excess of U.S. harvesting capacity can be taken by foreign fishermen. This has resulted in reduced foreign fishing efforts in U.S. waters. In 1975 there were more than 2,700 foreign fishing vessels off U.S. coasts. By 1978 this number was reduced to 600. The 1978 foreign catch within the 200 mile fishery conservation zone has been reduced to 1.7 million metric tons from a high of 3.5 million metric tons harvested in 1971.

The resources of the continental shelf off Virginia have traditionally supported an offshore fishery. Species such as

flounder, croaker, sea bass, sea trout and scup were the mainstay. Sea scallops were harvested during times of abundance or when finfish were unavailable. Yet, the most significant recent changes in Virginia's offshore fishing industry have occurred in the sea scallop fishery. In 1972 and 1973 the scallop stocks exhibited unusually high survival of seed which became available to the fishery beginning in 1975. Coincident with the increase in the abundance of harvestable sea scallops was an increase in demand and price. These conditions provided substantial capital for reinvestment in the fishing industry. As a result, a considerable number of larger, more sophisticated vessels have been built and are still being constructed.

This report summarizes the offshore fishing industry in Virginia in terms of its employment, income generated and overall economic impact to the economy of the Commonwealth. Data obtained for these purposes were also used to construct a budgetary analysis of offshore fishing vessels operating from ports in Virginia.

DESCRIPTION OF THE FISHERY

Data obtained from the National Marine Fisheries Service (NMFS) and the U.S. Coast Guard (USCG) indicate that 70 vessels were active in Virginia's offshore fishery during 1970. By 1978, the fleet had nearly tripled in size to 196 vessels (Table I). The increase in the number of vessels has been paralleled by the increase in vessel size, gross tonnage, horsepower, and crew size. A comparison of vessels constructed during the early 1970's with those vessels constructed in

TABLE I

Numbers of Vessels using Otter Trawls and Scallop Dredges Landing in Virginia from January 1970 through October 1979

	Otter Trawls	Scallop Dredge
1970	57	13
1971	52	10
1972	49	16
1973	55	16
1974	66	9
1975	84	6
1976	83	8
1977	102	23
1978	145	51
through October 1979	86	115

Source: 1970-75 information from Fishery Statistics of the United States. 1976-79 data from National Marine Fisheries Service, Hampton, Va.

1978 and 1979 reveal increases in average length of 6.1%, average gross tonnage of 15.7% and horsepower of 32.5% (Table II). Changes in vessel construction and crew size can, in part, be attributed to the requirements of the sea scallop fishery. Of the 25 vessels documented in Virginia during the first 7 months of 1979, 24 have entered the sea scallop fishery.

TABLE II

Characteristics of Vessels Landing in Virginia

between January and July 1979

Year Built or Delivered	Number	Av. Gross Tonnage	Av. Length	Av. Horsepower	Av. No. of Crew	Fish Trawlers	Scallop Trawlers	Scallop Dredge Vessels
1950-1959	3	111.3	81.1	430	3	2		1
1960-1969	33	93.9	68.2	353	6.2	22	6	16
1970-1974	24	113.1	70.9	405	7.8	17	2	10
1975	0							
1976	2	115	71	352	7.5	1		1
1977	8	126.4	76.4	641	11.7	2	1	7
1978	35	122.6	75.4	517	10.4	11		25
1979 through July	25	134.2	75.6	600	11.9	1	1	24

Most scallop vessels use 2 dredges which range from 9 to 15 feet in width. The dimensions of these dredges vary depending upon the size and power of the vessel (Table III). The use of standard sized trawl nets does not require as much vessel horsepower as the use of scallop dredges. An important characteristic of the newer vessels entering the offshore fishery is that they are "combination boats" capable of operating in either the scallop or finfish fisheries. These vessels have the flexibility to switch from one fishery to another with a minimum of time and expense.

TABLE III

Distribution of Offshore Vessels Landing in Virginia from January through July 1979 by Gear According to Horsepower*

Horsepower	Fish Trawls	Scallop Trawl	Scallop Dredges
Less Than 199	2		3
200-299	6	3	1
300-399	35	5	17
400-499	5	1	12
500-599	4		23
600 and Over	4		27

*Data presented in this table were provided by the National Marine Fisheries Service, and are limited to the number of vessels for which information was available. Certain vessels operated more than one type of gear during the 7 months and were counted under each gear they used.

Table IV. Virginia Trawler and Scallop Vessel Landings - 1970-1978.

	1970		1971		1972		1973		1974		1975		1976		1977		1978	
	Pounds	Value	Pounds	Value	Pounds	Value	Pounds	Value	Pounds	Value	Pounds	Value	Pounds	Value	Pounds	Value	Pounds	Value
Trawler Landings																		
Bluefish	37,000	3,357	18,700	1,619	44,000	3,994	121,400	10,091	83,100	8,607	67,700	6,280	28,100	3,400	70,100	7,098	67,700	6,280
Butterfish	1,164,000	154,073	425,600	69,713	19,000	3,815	55,000	10,546	43,600	8,950	48,700	9,305	13,900	3,366	44,600	9,778	81,500	19,239
Croaker	4,700	3,735	52,200	4,971	97,400	12,415	308,700	36,442	480,500	49,765	1,335,000	116,283	926,300	102,948	651,000	86,135	836,000	168,775
Fluke	1,966,300	564,292	1,568,300	468,064	1,681,600	545,362	2,770,400	748,581	2,688,800	667,917	2,945,700	816,252	2,880,800	1,016,959	4,136,400	1,840,179	5,353,600	2,532,095
Other Flounder	66,700	5,288	16,400	666	30,400	3,121	3,100	399	4,200	202	800	61	1,800	368	20,800	3,307	223,100	28,364
Mackerel, At.	156,000	7,993	65,100	2,142	4,600	314	1,900	345	9,400	1,500	146,300	16,481	190,100	26,265	4,400	1,351	34,300	4,352
Scallops[a]	0	0	1,100	1,618	2,800	5,126	2,000	3,720	34,600	51,917	373,100	680,986	29,100	59,335	800	12,559	800	15,247
Scup	2,074,800	361,735	1,910,900	209,188	1,297,400	152,334	820,900	155,965	471,700	59,024	407,400	70,909	265,600	51,408	797,700	165,152	1,079,100	172,542
Sea Bass	1,029,200	185,370	628,400	114,822	631,700	135,758	1,074,800	219,907	735,500	220,910	1,385,800	309,916	726,100	193,902	1,612,900	396,032	1,560,200	569,248
Sea Trout, Grey	175,400	23,853	139,100	14,065	267,100	34,647	423,400	64,067	429,900	50,943	575,600	61,107	288,100	32,771	365,900	56,421	410,800	65,766
Spot	24,900	2,793	3,000	215	2,400	243	76,900	9,636	70,200	8,737	50,300	6,265	43,900	6,059	17,600	2,340	95,300	14,043
Squid	421,700	25,110	409,500	37,752	261,600	29,385	158,900	19,513	168,800	24,882	100,700	11,365	109,300	12,219	60,400	12,559	128,800	40,136
Striped Bass	574,300	112,657	75,600	14,800	123,700	30,001	65,000	26,236	51,000	24,009	62,400	30,419	20,300	15,668	7,100	6,936	5,900	5,363
Whiting	28,300	3,085	80,300	5,871	9,400	654	9,800	2,366	4,800	532	6,000	909	5,000	364	27,400	1,641	82,000	10,396
Other	376,400	93,201	231,600	115,006	149,300	15,647	217,100	28,354	93,100	8,071	69,800	10,825	86,510	7,071	121,900	25,448	345,700	56,470
Total	8,099,700	1,546,542	5,625,800	1,060,512	4,622,400	972,916	6,109,300	1,336,168	5,369,200	1,185,966	7,575,300	2,147,363	5,614,910	1,532,103	7,939,000	2,626,936	10,304,800	3,708,316
Scallop Vessel Landings																		
Scallops[a]	750,400	991,882	543,400	800,315	957,700	1,850,712	770,600	1,342,942	837,700	1,224,522	880,900	1,620,895	1,474,700	2,713,457	2,712,800	4,509,023	7,125,090	17,358,614
Other	23,900	6,890	14,000	3,290	23,400	7,458	25,900	7,298	22,800	5,383	35,500	9,454	55,800	16,623	170,100	63,472	324,610	121,311
Total	774,300	998,772	557,400	803,605	981,100	1,858,170	796,500	1,350,240	860,500	1,229,905	916,400	1,630,349	1,530,500	2,730,080	2,882,900	4,572,545	7,449,700	17,479,925

[a] Scallop figures exclude scallop trawl

Sources: Fishery Statistics of the United States, 1970-1974, U.S. Department of Commerce; National Marine Fisheries Service, Hampton, Virginia

Virginia trawler and sea scallop vessel landings have been summarized for the period 1970-1978 (Table IV). Fluke represented the major component of trawler landings with landings ranging from 468,000 pounds in 1971 to 5,353,000 pounds in 1978 with an ex-vessel value of over $2.5 million. Hampton Roads landings of the fluke for the first 7 months of 1979 totalled 3.46 million pounds, a 76% increase for the same period in 1978. Total 1978 finfish landings by the offshore fishery was 10.3 million pounds with an ex-vessel value of $3.7 million. Scup, black sea bass and croaker were also major components of the offshore fishery. During the same period, sea scallop landings ranged from 543,400 pounds in 1971 to over 7.1 million pounds in 1978 with an ex-vessel value of more than $17.3 million. A more detailed breakdown of the offshore fishery landings for the ports of Hampton Roads and Chincoteague Va. during 1978 and 1979 is presented in Tables V and VI.

Trawler and scallop vessel trip statistics for the port of Hampton Roads have been summarized for the years 1975 to 1979 (Table VII). There has been a dramatic increase in the number of scallop vessel and trawler trips during the past four years. However there has been a significant decrease in the catch per unit effort for scallops over the past year to an average of 5000 lbs per trip for the month of September, 1979. Despite the drop in landings the continued strong demand and high ex-vessel price for scallops will continue to support this fishery for the foreseeable future, but at a reduced level. It is expected that the yearly average for 1979 will drop to

Table V. Hampton Roads Trawler and Scallop Vessel Landings (1000's pounds) Classified by Major Species

Months	1978 Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	1979 Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept
Trawler Landings (1000's pounds)																					
Bluefish	15		3	9	1				1	4	6	23	8	12	1	193	21				
Butterfish		5	15	15	6	3	1	1	1	7	2	1		7	19	3	1				
Croaker	20			112					97	147				4	8	1					
Fluke	498	385	467	409	107	92	8	27	130	328	807	786	795	947	1047	610	10		49		
Other Flounder	8				5			16		95	29	17	10	5	10	11	3		33		
Mackerel, At.			11	19	2											1					
Scup	25	52	385	247	279								79	335	255	134					
Sea Bass	324	166	431	336	97	1				3	7	1	139	232	391	263	5				
Sea Trout, Grey	6	1	3	7				1	14	81	87	105	18	12		166	75	1			
Spot	2			2				1	4	62											
Squid													50	118	155						
Whiting		9	9	39	12								1	4	11	55	3				
Trawler Trips	55	49	73	65	33	12	4	13	41	86	92	55	101	99	95	85	13	1	10	24	34
Pounds per Trip	16.4	12.7	18.2	19.0	15.4	9.2	2.8	3.6	6.2	8.5	10.2	17.2	11.6	17.6	24.2	17.3	9.2	2.0	8.8	5.7	6.0
Scallop Vessel Landings																					
Scallops	229	179	351	477	763	1062	889	923	621	776	427	224	164	161	489	690	920	1130	1177	1008	633
Scalloper Trips	36	27	40	37	49	67	68	79	89	89	69	53	49	47	61	79	80	111	144	144	127
Pounds per Trip	6.4	6.6	8.8	12.9	15.6	15.9	13.1	11.7	7.0	8.7	6.2	4.2	3.4	3.4	8.0	8.7	11.5	10.2	8.2	7.0	5.0

Table VI. Chincoteague Trawler Landings (1000's pounds) Classified by Major Species

Months	1978 Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	1979 Jan	Feb	Mar	Apr	May	Jun	Jul
Species:																			
Bluefish		1			1					1									
Butterfish				1	1										2				
Croaker									40	92	2							1	
Fluke	49	54	80	24	45	44	15	119	119	139	67	104	105	57	88	148	61	76	191
Other Flounder										43	39								
Mackerel, At.			2												1				
Scup	41	4	7	3	15						39				14				
Sea Bass	19		3	2	5					1			2	3	6	6	1		
Sea Trout, Grey	7		2						1			1		5		4			
Spot							1		1	14	31								3
Whiting					1						1					7			
Others		2		1	13	1	1		6	1		1	3		7	9	2		1
Scallop Vessel Landings																			
Scallops					6	34	62	41	8	15					3	11	106	29	11

Sources: "Fishery Market News Report," U. S. Department of Commerce, NOAA, National Marine Fisheries Service, National Marine Fisheries Service, Hampton, Va.

less than 7000 lbs of scallops per trip. Landings of finfish on a per trip basis for 1979 should not show a major decline from 1977 and 1978

TABLE VII

Trawler and Scallop Vessel Annual Trip Statistics, Hampton Roads, 1975-1978.

	1975	1976	1977	1978	JAN-SEPT 1979
Trawlers					
Number of Trips	359	355	416	578	462
Average Pounds Per Trip	14,430	13,451	14,710	14,084	11,380
Average Value Per Trip	4,731	4,316	4,481	5,106	
Scallop Vessels					
Number of Trips	104	122	228	703	842
Average Pounds Per Trip	8,812	12,545	12,664	10,300	7,567
Average Value Per Trip	$15,676	$22,378	$20,055	$24,112	$19,676*

Source: National Marine Fisheries Service, Hampton, Va.
*Estimated

levels as the last quarter of the year is generally quite productive for offshore trawlers.

The growth of the offshore fishing industry, as reflected by the increases in trawler and scallop vessel trips since 1976, will continue to exert considerable impact on the economy, employment and port facilities of coastal Virginia. However, the continued growth

and prosperity of the offshore fishing industry will in part depend upon the development of underutilized fishery resources of the Mid Atlantic region. Species such as mackerel, squid, butterfish, herring and shark all have the potential for developing into major components of Virginia's fishing industry.[1]

The surf clam fishery was excluded in this discussion of Virginia's other offshore fisheries because of special problems related to the fishery. The surf clam fishery has been regulated by the Mid Atlantic Fisheries Management Council Fishery Management Plan (FMP) for Surf Clams and Ocean Quahogs since November of 1977.[2] The management plan for this fishery have established quotas, limited effort (in terms of number of fishing days) and closed the fishery to new entrants until December 1980. The regulations have limited fishing effort to as little as 24 hours of fishing time per vessel per week. Under the restrictions and quotas established by the FMP the surf clam fishery continues to contribute significantly to Virginia's economy. Preliminary data from the National Marine Fisheries Service

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[1] For a complete discussion of underutilized fishery resources and their potential for development refer to: Prospectus for Development of the United States Fisheries. Prepared for the Fisheries Development Task Force, NOAA, Dept. of Commerce. Earl R. Coombs, Inc., Mercer Island, Washington. May 1979.

[2] Final Environmental Impact Statement/Fisheries Management Plan For Surf Clam and Ocean Quahog Fisheries 1977. Mid Atlantic Fishery Management Council in consultation with the New England and South Atlantic Fishery Management Councils.

for 1978 indicate that over 12.7 million pounds of meats were landed and were valued at over $7 million. Surf clams accounted for 16% of the total value of all fisheries products landed in Virginia in 1977.

The present regulation intentionally limits the potential harvest in the fishery in order to permit the stocks to rebuild for greater future yield. Unfortunately, the specialized equipment used in this fishery does not allow easy conversion to other offshore fisheries unless the ocean quahog is sought.

Currently, the optimum yield for ocean quahogs is 40 million pounds. Total landings in 1977 were 8.4 million pounds and accounted for 20% by weight and 7.5% by ex-vessel value of all clams harvested in the U.S. This is up from the early 1970's when ocean quahogs accounted for only about 1% of the total weight and less than 1% of the total ex-vessel value. The industry has made some progress toward developing this fishery but there is still substantial room for expansion.

METHODS

Information on fishing vessel statistics were compiled from data supplied by the National Marine Fisheries Service (NMFS), Hampton, Va, and the U.S. Coast Guard (USCG), Merchant Vessel Documentation Division, Washington, D.C. Data on landings and trip statistics were obtained from information supplied by NMFS, Hampton, Va., U.S. Department of Commerce Fishery Statistics 1970-1974, and vessel settlement sheets supplied by industry.

The analysis of cost and return of Virginia based finfish trawlers for the period 1 April 1978 to 1 April 1979 was calculated using data for twelve vessels. Five vessels were between 60-80 feet in length with an average horsepower of 371 and seven vessels were between 80-100 feet in length with an average horsepower of 568 (Table VIII). Vessel settlement sheets were used to obtain data on the value of landings, crew shares, crew expenses, ice, food, fuel and gear maintenance. Interest expenses were computed at 10% of the market value of the vessel. This expense represents the approximate annual costs of borrowing or the opportunity cost of investing in a trawler rather than making other investments earning at 10% return.[3]

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[3] If, for example, a $500,000 trawler is purchased by borrowing $300,000 and paying $200,000 cash, the annual explicit interest expenses is $30,000 (.10 times $300,000) and the (implicit) opportunity cost of invested capital is $20,000 (.10 times $200,000), totalling explicit and implicit interest expenses of $50,000 per year.

TABLE VIII

Characteristics of Vessels used to obtain Baseline Economic Data.

	Vessels Directing Effort at Finfish (N=12)
60-80 Feet Class (N=5)	
Avg. Length (feet)	69
Avg. Gross Tons.	88
Avg. Horsepower	371
Avg. Age (years)	14
Percent Steel Construction	60%
80-100 Feet Class (N=7)	
Avg. Length (feet)	91
Avg. Gross Tons	154
Avg. Horsepower	568
Avg. Age (years)	8
Percent Steel Construction	88%
	Full-time Scallop Vessels (N=12)
Avg. Length (feet)	81
Avg. Gross Tons	147
Avg. Horsepower	631
Avg. Age (years)	8
Percent Steel Construction	92%

Data on sea scallop vessels were obtained from an earlier study (DuPaul and Baker, 1978)[4] based on twelve vessels operating during the period 1 July 1977 to 1 July 1978 and updated for comparison purposes.

Break-even levels of annual revenue were calculated for each vessel size class on the assumption that crew shares remain a constant fraction of the value of landings and that other expenses remain at levels consistent with 1978-1979 effort.

An income multiplier[5] of 2.49 was estimated based on the ratio of changes in total income to changes in basic sector income. For the Hampton-Newport News area, the income multiplier (IM) was calculated as:

IM = TI/BI

where TI = the change in total income, 1970-1975 and BI = the change in basic sector income, 1970-1975.

Employment in processing and at marine suppliers generated by each type of vessel and processing activity was assumed to be equal to the basic sector income divided by a weighted average wage rate for

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[4] An earlier study (DuPaul and Baker, 1978) reports a budgetary analysis of Virginia scallopers and provides a basis for calculating the economic impact of sea scallop vessels.

[5] Data were obtained from Local Area Personal Income, 1970-1975 (U.S. Department of Commerce Bureau of Economic Analysis, 1977). An income multiplier of 2.49 means that for every $1.00 of income generated in the basic sector (e.g., paid to scallop vessels crews) another $1.49 of income is generated in the service sector as the initial $1.00 is spent.

processors and suppliers. The weighted average annual wage rate equals $7831 and is based on Virginia Employment Commission data on employment and earnings for each processing and marine supply establishment. Service sector employment was estimated as total income minus basic sector income divided by the average annual earnings ($8521) per service sector worker in the Hampton-Newport News Area.

THE ECONOMIC IMPACT OF OFFSHORE TRAWLERS AND SCALLOP VESSELS LANDING IN VIRGINIA PORTS, 1978-1979

The economic impact of offshore trawlers and scallop vessels consists of direct and indirect income effects. Direct, or basic sector effects include income generated on vessels, on-shore processing and in firms supplying goods and services to vessel operations. Indirect, or service sector effects (e.g. retailing activity) consist of income resulting from the spending of basic sector earnings.

An income multiplier of 2.49 was used to estimate the economic impact of the offshore fishing industry. Income multipliers are based on the premise that a stable relationship exists between an area's total income and that portion of income generated in the basic sector. Employment in the basic sector include fishing, manufacturing, mining, agriculture, and federal employment. Basic sector employment and income are viewed as generating additional employment and income in the service sector.

Income and employment data for the offshore fishing industry for Hampton Roads and for Virginia as a whole are summarized in Tables IX and X. Employment data were calculated as full-time equivalents on the basis of yearly employment for each type of vessel and processing activity. It is understood that this may not always be the case as employment in various sectors of the fishing industry fluctuate

Table IX. Income and Employment Generated by Trawlers and Scallop Vessels in Virginia, 1978.

Type of Vessel Activity	Basic Sector Income	Basic Plus Service Sector Income	Basic Plus Service Sector Income	Basic Sector Employment*	Basic Sector Plus Service Sector Employment*
Trawling (Finfish)	On Vessels	$ 2,037,136	$ 5,072,468	125	481
	In Processing and at Suppliers	3,275,696	8,156,484	418	990
	Subtotal	5,312,832	13,228,952	543	1471
Trawling (Scallops)	On Vessels	308,577	768,356	18	74
	In Processing and at Suppliers	97,352	101,562	13	30
	Subtotal	405,929	869,918	31	104
Scallop Dredge	On Vessels	9,606,060	23,919,091	362	2069
	In Processing and at Suppliers	2,547,744	6,452,494	326	772
	Subtotal	12,153,804	30,371,585	688	2814
Total		17,872,565	44,470,455	1262	4389

*Employment figures represent full-time employment equivalents. That is, these employment data are based on the assumption that fishermen are employed full-time on a yearly basis for each type of vessel and processing activity.

Table X. Income and Employment Generated by Trawlers and Scallop Vessels in the Hampton Roads Area, 1978

Type of Vessel Activity	Basic Sector Income Components	Basic Sector Income	Basic Plus Service Sector Income	Basic Sector Employment*	Basic Sector Plus Service Sector Employment*
Trawling (Finfish)	On vessels	$ 1,531,681	$ 3,813,886	75	343
	In Processing and at Suppliers	2,587,800	6,443,622	330	783
	Subtotal	4,119,481	10,257,508	405	1126
Trawling (Scallops)	On Vessels	225,261	560,900	11	50
	In Processing and at Suppliers	69,152	172,188	9	21
	Subtotal	294,413	733,088	20	71
Scallop Dredge	On Vessels	9,286,231	23,122,716	350	1974
	In Processing and at Suppliers	2,462,918	6,132,665	315	746
	Subtotal	11,749,149	29,255,381	665	2720
Total		16,163,043	40,245,977	1090	3917

*On vessel employment figures represent full-time employment equivalents. That is, these employment data are based on the assumption that fishermen are employed full-time on a yearly basis for each type of vessel and processing activity.

seasonally. Such fluctuations were taken into account in computing employment and income data for each activity.

Separate estimates of income impact were calculated for both offshore trawlers and scallop vessels. Income generated on Hampton Roads trawlers for 1978-79 averaged 51.9% of the value of finfish landed. Since the total value of trawler landings in Hampton Roads during 1978 was $2.95 million, income generated on vessels was $1.53 million. Based on surveys of processors and data from the Virginia Employment Commission (Hampton Roads area) on-shore employment in finfish processing generated an additional $2.59 million. The port of Chincoteague Va. and several smaller landing areas contributed an additional $.51 million in income generated on vessels and $.31 million generated at processors and suppliers. During 1978, the sea scallop fishery in Virginia generated a total of $9.9 million of income as a result of on-vessel employment and $2.6 million at processors and suppliers providing goods and services.

Additional income is generated by fishing vessel operations resulting from direct purchases of goods and services. Table XI summarizes expenses and the resulting income generated by offshore trawlers purchasing goods and supplies for fishing operations. Total expenses for 1978 were $910,818 which generated $117,800 in basic sector income. These figures were obtained using weighted averages for the size class of the trawlers, time finfishing v.s. scallop fishing, and the number of trips per year. A similar set of data for

TABLE XI

Basic Sector Impact of Firms Supplying Goods and Services to Trawlers, 1978.

Type of Good or Service	Total Annual Expenses	Income Sales Ratio	Basic Sector Income Impact
Petroleum Products	$440,436	.09[a]	$39,639
Grocery Supplies	167,042	.09[a]	15,034
Frozen Foods (Ice)	82,654	.06[a]	4,959
Marine Supplies and Repairs	83,810	.20[b]	16,762
Electrical & Electric Suppliers	61,636	.33[a]	20,339
Marine Service (engine & hull)	75,240	.28[b]	21,067
Totals	$910,818		$117,800

[a] Source: Census of Wholesale Trade, 1972, Volume II, Area Statistics.
[b] Based on survey of Hampton Roads suppliers.

sea scallop vessels was developed by DuPaul and Baker, 1978 and were updated to include all of 1978 for inclusion into Tables IX and X.

All activities associated with the Virginia offshore fishing industry produced $17.9 million of basic sector income with an employment level of 1262 full-time equivalents. Combining basic sector and service sector impact, the offshore fishing industry in

Virginia during 1978 generated $44.5 million in income with an employment level of 4389 full time equivalents.

ANALYSIS OF COST AND RETURN

The cost and return analyses of Virginia based finfish trawlers for the period 1 April 1978 to 1 April 1979 were based on data for twelve vessels. Net return, which is the difference between the value of landings and total costs, was highest for vessels on the 80-100 ft class.[6] The $65,479 return to vessels in this size class is somewhat less than the average return of $86,230 for similar sized and powered vessel working full time in the scallop fishery (DuPaul and Baker 1978). Since there is considerable switching between finfishing and scalloping by these multipurpose vessels, such comparable returns could be expected (Tables XII and XIII).

Vessels in the 60-80 ft size class had a net return for the period of $32,856 which is considerably less than the larger class of vessels. There are several possible reasons for this difference other than the fact that the larger vessels have an greater overall fishing capacity: 1) 60-80 ft size class vessels spent less time in the scallop fishery, 2) the average age of the vessels was greater, and 3) two of the vessels were side trawlers. (Tables VIII and XIII). A break-even level and net return graph based on annual revenue (1 April 78 - 1 April 79) for each vessel size class fishing trawler is

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[6] Net return equals economic profit before income taxes. If a vessel is fully owned (without a loan) accounting profit would also include the opportunity cost of investing the market or sale price of the boat in its best alternative investment, here assumed to be one with a 10% profit rate.

TABLE XII

Budgetary Analysis of Virginia Trawlers, 1 April 1978-
1 April 1979

Average Annual Cost and Return	60-80 feet N = 5	80-100 feet N = 7
Value of Landings	$254,462	$505,552
Variable Costs		
Crew Share	128,190	267,924
Fuel[a]	24,763	42,391
Engine Overhaul	3,218	4,516
Gear Maintenance	5,102	7,118
Electronics	1,273	1,910
Food	8,607	17,868
Ice	4,015	6,908
Other[b]	6,538	13,138
Fixed Costs		
Interest	21,000	47,000
Insurance	14,000	26,000
Hull Maintenance	4,200	7,000
Property Taxes	700	2,300
Total Cost	221,606	440,073
Net Return	32,856	61,479

[a]subject to substantial increases
[b]Includes settlement fees, payroll taxes, and miscellaneous expenses

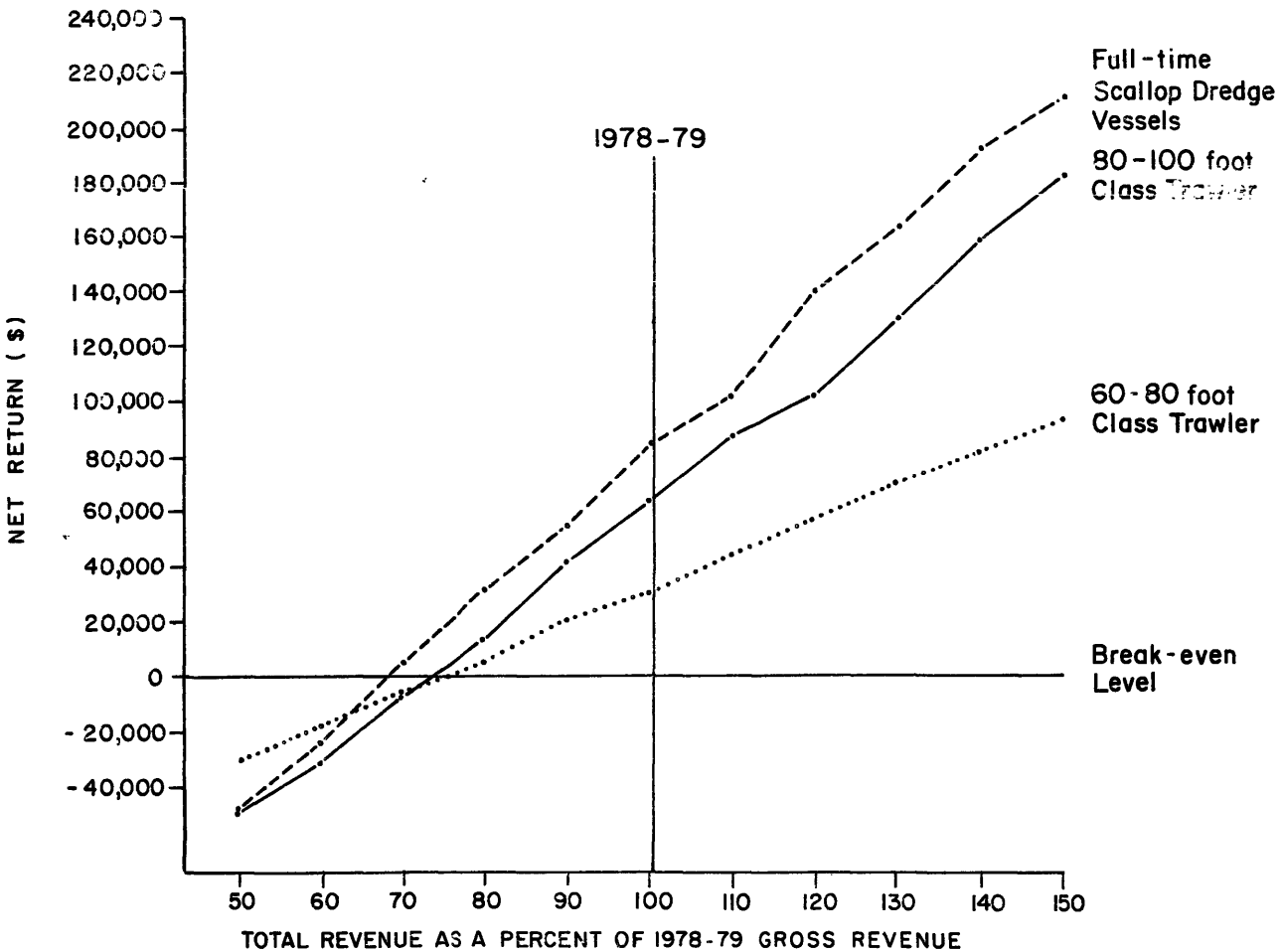

Figure 1. Net Return at Alternative Revenue Levels.

TABLE XIII

Average Operational Characteristics of Virginia Vessels

	Vessel Size Class	
	N = 5	N = 7
	60-80 feet	80-100 feet
No. of Months Fished	8.4	7.5
No. of Months Scalloped	3.6	4.5
No. of Fishing Trips Per Mo.	4.2	4.0
No. of Scallop Trips Per Mo.	2.0	2.0
Fuel Expense Per Fish Trip	$621	$863
Fuel Expense Per Scallop Trip	$976	$2193
Food Expense Per Fish Trip	$196	$356
Food Expense Per Scallop Trip	$418	$947
Ice Expense Per Fish Trip	$101	$173
Ice Expense Per Scallop Trip	$157	$263

presented in Figure 1. The break-even level is defined as that point where total revenue is equal to total costs. Changes in the base year revenue can occur due to fluctuations in fish stocks and, or changes in the price of fish. Vessels in the 60-80 ft class fail to break even at a total revenue less than 74% of the base year level. Vessels in the 80-100 ft class fail to break-even at total revenue levels less than 72% of the base year level. The data on full time scallop vessels are for the base year of 1 July 77 to 1 July 1978.

LITERATURE CITED

DuPaul, W. D. and S. Baker. 1978. The Economic Impact of the Sea Scallop Placopecten magellanicus Fishery in Virginia. Special Report in Applied Marine Science and Ocean Engineering No. 222. Virginia Institute of Marine Science, Gloucester Point, Virginia.